

Study Guide 22-25

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

The following questions refer to the evolutionary tree in Figure 22.2.

The horizontal axis of the cladogram depicted below is a timeline that extends from 100,000 years ago to the present; the vertical axis represents nothing in particular. The labeled branch points on the tree (V—Z) represent various common ancestors. Let's say that only since 50,000 years ago has there been enough variation between the lineages depicted here to separate them into distinct species, and only the tips of the lineages on this tree represent distinct species.

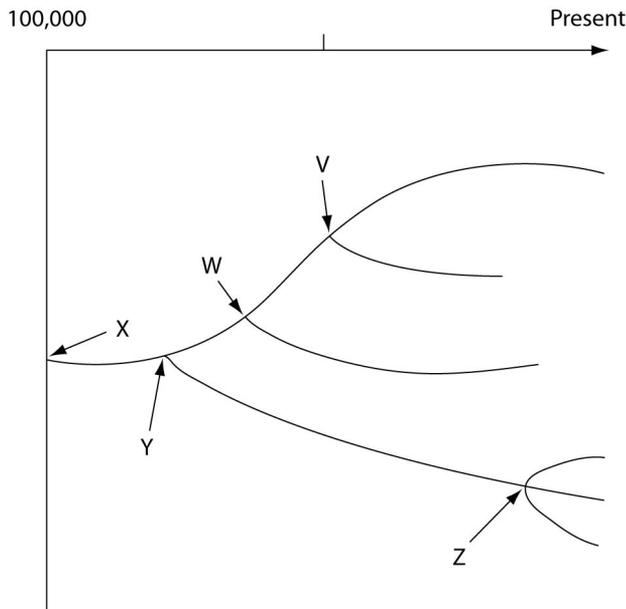


Figure 22.2

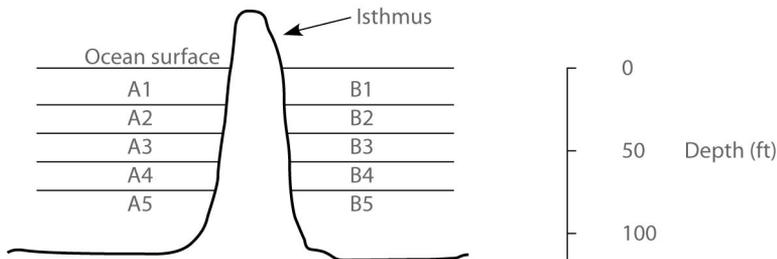
- 1) Which of the five common ancestors, labeled V—Z, has been least successful in terms of the percent of its derived species that are extant? 1) _____
 A) V B) W C) X D) Y E) Z

- 2) During breeding season, one should expect female house finches to prefer to mate with males with the brightest red feathers. Which of the following terms are appropriately applied to this situation? 2) _____
 A) mate choice
 B) sexual selection
 C) intersexual selection
 D) Three of the responses are correct.
 E) Two of the responses are correct.

The next few questions refer to the following description.

In the ocean, on either side of the Isthmus of Panama, are 30 species of snapping shrimp; some are shallow-water species, others are adapted to deep water. There are 15 species on the Pacific side and 15 different species on the Atlantic side. The Isthmus of Panama started rising about 10 million years ago.

In the following figure, the isthmus separates the Pacific Ocean on the left (side A) from the Atlantic Ocean on the right (side B). The seawater on either side of the isthmus is separated into five depth habitats (1—5), with 1 being the shallowest.



- 3) Which factor is most important for explaining why there are equal numbers of snapping shrimp species on either side of the isthmus? 3) _____
- A) the number of actual depth habitats between the surface and the sea floor
 - B) the elevation of the isthmus above sea level
 - C) the depth of the canal
 - D) the depth of the ocean
 - E) the relative shortness of time they have been separated
- 4) The existence of the phenomenon of exaptation is most closely associated with which of the following observations that natural selection cannot fashion perfect organisms? 4) _____
- A) Evolution is limited by historical constraints.
 - B) Chance events affect the evolutionary history of populations in environments that can change unpredictably.
 - C) Adaptations are often compromises.
 - D) Natural selection and sexual selection can work at cross-purposes to each other.
- 5) Which of the following is a defining characteristic that all protobionts had in common? 5) _____
- A) the ability to synthesize enzymes
 - B) the ability to replicate RNA
 - C) RNA genes
 - D) a surrounding membrane or membrane-like structure
- 6) Which factor most likely caused animals and plants in India to differ greatly from species in nearby southeast Asia? 6) _____
- A) India was a separate continent until 45 million years ago.
 - B) Life in India was wiped out by ancient volcanic eruptions.
 - C) The climates of the two regions are similar.
 - D) The species have become separated by convergent evolution.
 - E) India is in the process of separating from the rest of Asia.

The following questions refer to the description and figure below.

The figure represents a cross section of the sea floor through a mid-ocean rift valley, with alternating patches of black and white indicating sea floor with reversed magnetic polarities. At the arrow labeled "I" (the rift valley), the igneous rock of the sea floor is so young that it can be accurately dated using carbon-14 dating. At the arrow labeled "III," however, the igneous rock is about 1 million years old, and potassium-40 dating is typically used to date such rocks. *Note:* The horizontal arrows indicate the direction of sea-floor spreading, away from the rift valley.

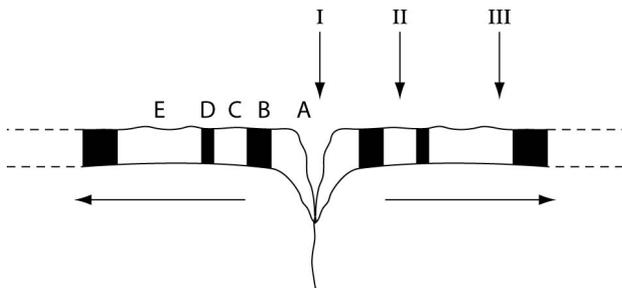


Figure 25.1

- 7) Assuming that the rate of sea-floor spreading was constant during the 1-million-year period depicted above, what should be the approximate age of marine fossils found in undisturbed sedimentary rock immediately overlying the igneous rock at the arrow labeled "II"? 7) _____
- A) 10,000 years B) 250,000 years C) 1,000,000 years D) 400,000 years

The following questions refer to this hypothetical situation.

A female fly, full of fertilized eggs, is swept by high winds to an island far out to sea. She is the first fly to arrive on this island, and the only fly to arrive in this way. Thousands of years later, her numerous offspring occupy the island, but none of them resembles her. There are, instead, several species, each of which eats only a certain type of food. None of the species can fly, for their flight wings are absent, and their balancing organs (in other words, halteres) are now used in courtship displays. The male members of each species bear modified halteres that are unique in appearance to their species. Females bear vestigial halteres. The ranges of all of the daughter species overlap.

- 8) Fly species W, found in a certain part of the island, produces fertile offspring with species Y. 8) _____
 Species W does not produce fertile offspring with species X or Z. If no other species can hybridize, then species W and Y
- A) have more genetic similarity with each other than either did with the other two species.
 B) have genomes that are still similar enough for successful meiosis to occur in hybrid flies.
 C) may fuse into a single species if their hybrids remain fertile over the course of many generations.
 D) Three of the above statements are correct.
 E) Two of the statements above are correct.
- 9) A genetic change that caused a certain *Hox* gene to be expressed along the tip of a vertebrate limb bud instead of farther back helped make possible the evolution of the tetrapod limb. This type of change is illustrative of 9) _____
- A) the influence of environment on development.
 B) pedomorphosis.
 C) a change in a developmental gene or its regulation that altered the spatial organization of body parts.
 D) gene duplication.
 E) heterochrony.

- 10) Which measurement(s) would help determine absolute dates by radiometric means? 10) _____
- A) the loss of parent isotopes
 - B) the accumulation of the daughter isotope
 - C) the loss of daughter isotopes
 - D) Three of the responses above are correct.
 - E) Two of the responses above are correct.

- 11) An early consequence of the release of oxygen gas by plant and bacterial photosynthesis was to 11) _____
- A) generate intense lightning storms.
 - B) change the atmosphere from oxidizing to reducing.
 - C) prevent the formation of an ozone layer.
 - D) cause iron in ocean water and terrestrial rocks to rust (oxidize).
 - E) make it easier to maintain reduced molecules.

The following questions are based on the observation that several dozen different proteins comprise the prokaryotic flagellum and its attachment to the prokaryotic cell, producing a highly complex structure.

- 12) Certain proteins of the complex motor that drives bacterial flagella are modified versions of proteins that had previously belonged to plasma membrane pumps. This evidence supports the claim that 12) _____
- A) the motors of bacterial flagella were originally synthesized abiotically.
 - B) some structures are so complex that natural selection cannot, and will not, explain their origins.
 - C) natural selection can produce new structures by coupling together parts of other structures.
 - D) bacteria that possess flagella must have lost the ability to pump certain chemicals across their plasma membranes.
 - E) the power of natural selection allows it to act in an almost predictive fashion, producing organs that will be needed in future environments.

- 13) What is true of the Cambrian explosion? 13) _____
- A) Recent evidence supports the contention that the Cambrian explosion may not have been as "explosive" as was once thought.
 - B) Only the fossils of microorganisms are found in geological strata older than the Cambrian explosion.
 - C) There are no fossils in geological strata that are older than the Cambrian explosion.
 - D) The Cambrian explosion marks the appearance of filter-feeding animals in the fossil record.
 - E) The Cambrian explosion is evidence for the instantaneous creation of life on Earth.

- 14) Which of these observations gives the most support to the endosymbiotic theory for the origin of eukaryotic cells? 14) _____
- A) the similarity in size between the cytosolic ribosomes of prokaryotes and the ribosomes within mitochondria and chloroplasts
 - B) the observation that some eukaryotic cells lack mitochondria
 - C) the size disparity between most prokaryotic cells and most eukaryotic cells
 - D) the existence of structural and molecular differences between the plasma membranes of prokaryotes and the internal membranes of mitochondria and chloroplasts

The next few questions refer to the following description.

On the Bahamian island of Andros, mosquitofish populations live in various, now-isolated, freshwater ponds that were once united. Currently, some predator-rich ponds have mosquitofish that can swim in short, fast bursts; other predator-poor ponds have mosquitofish that can swim continuously for a long time. When placed together in the same body of water, the two kinds of female mosquitofish exhibit exclusive breeding preferences.

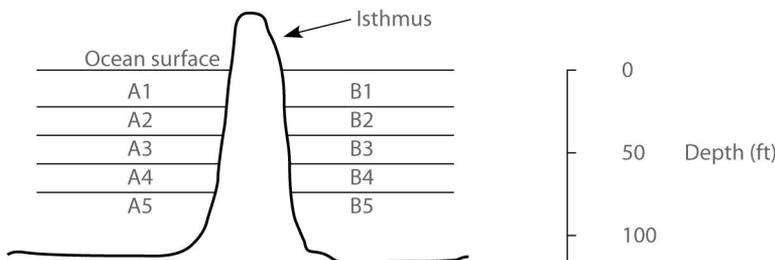
- 15) Which *two* of the following have operated to increase divergence between mosquitofish populations on Andros? 15) _____
1. improved gene flow
 2. bottleneck effect
 3. sexual selection
 4. founder effect
 5. natural selection
- A) 3 and 5 B) 2 and 3 C) 3 and 4 D) 1 and 3 E) 2 and 4

- 16) The *largest* unit within which gene flow can readily occur is a 16) _____
- A) genus.
 - B) population.
 - C) phylum.
 - D) species.
 - E) hybrid.

The next few questions refer to the following description.

In the ocean, on either side of the Isthmus of Panama, are 30 species of snapping shrimp; some are shallow-water species, others are adapted to deep water. There are 15 species on the Pacific side and 15 different species on the Atlantic side. The Isthmus of Panama started rising about 10 million years ago.

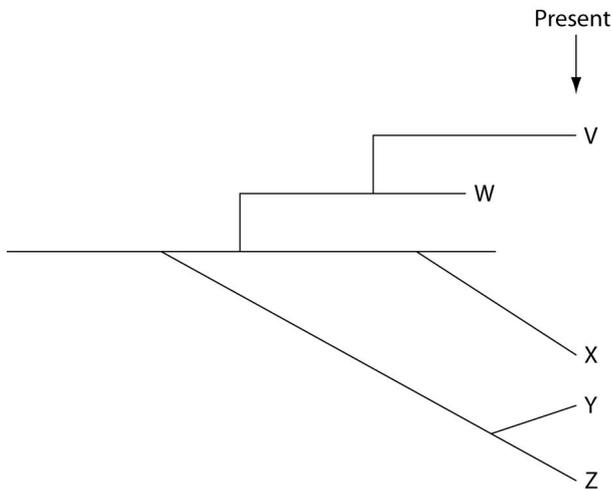
In the following figure, the isthmus separates the Pacific Ocean on the left (side A) from the Atlantic Ocean on the right (side B). The seawater on either side of the isthmus is separated into five depth habitats (1—5), with 1 being the shallowest.



- 17) Which of these habitats is likely to harbor the youngest species? 17) _____
- A) B2 B) A5 C) A1 D) B4 E) A3

- 18) According to the concept of punctuated equilibrium, 18) _____
- A) evolution of new species features long periods during which changes are occurring, interspersed with short periods of equilibrium, or stasis.
 - B) given enough time, most existing species will branch gradually into new species.
 - C) transitional fossils, intermediate between newer species and their parent species, should be abundant.
 - D) natural selection is unimportant as a mechanism of evolution.
 - E) a new species accumulates most of its unique features as it comes into existence.

The next few questions refer to the following evolutionary tree, whose horizontal axis represents time (present time is on the far right) and whose vertical axis represents morphological change.



- 19) Which conclusion can be drawn from this evolutionary tree? 19) _____
- A) Assuming that the tip of each line represents a species, there are five extant (i.e., not extinct) species resulting from the earliest common ancestor.
 - B) V and W shared a common ancestor more recently than any of the other species.
 - C) Eldredge and Gould would deny that the lineages labeled X, Y, and Z could represent true species.
 - D) Gradualistic speciation and speciation involving punctuated equilibrium are mutually exclusive concepts; only one of them can occur.
 - E) A single clade (i.e., a group of species that share a common ancestor) can exhibit both gradualism and punctuated equilibrium.
- 20) Males of different species of the fruit fly *Drosophila* that live in the same parts of the Hawaiian Islands have different elaborate courtship rituals. These rituals involve fighting other males and making stylized movements that attract females. What type of reproductive isolation does this represent? 20) _____
- A) temporal isolation
 - B) gametic isolation
 - C) postzygotic barriers
 - D) habitat isolation
 - E) behavioral isolation
- 21) The most likely explanation for the high rate of sympatric speciation that apparently existed among the cichlids of Lake Victoria in the past is 21) _____
- A) sexual selection.
 - B) habitat differentiation.
 - C) pollution.
 - D) introduction of a new predator.
 - E) polyploidy.

22) Among known plant species, which of these have been the *two* most commonly occurring phenomena that have led to the origin of new species?

22) _____

1. allopatric speciation
2. sympatric speciation
3. sexual selection
4. polyploidy

A) 2 and 3

B) 1 and 4

C) 2 and 4

D) 1 and 3

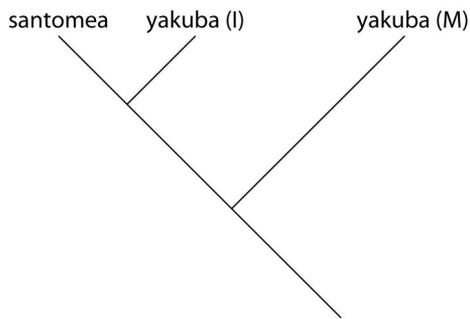
The next few questions refer to the following description.

On the volcanic, equatorial West African island of Sao Tomé, two species of fruit fly exist. *Drosophila yakuba* inhabits the island's lowlands, and is also found on the African mainland, located about 200 miles away. At higher elevations, and only on Sao Tomé, is found the very closely related *Drosophila santomea*. The two species can hybridize, though male hybrids are sterile. A hybrid zone exists at middle elevations, though hybrids there are greatly outnumbered by *D. santomea*. Studies of the two species' nuclear genomes reveal that *D. yakuba* on the island is more closely related to mainland *D. yakuba* than to *D. santomea* ($2n = 4$ in both species). Sao Tomé rose from the Atlantic Ocean about 14 million years ago.

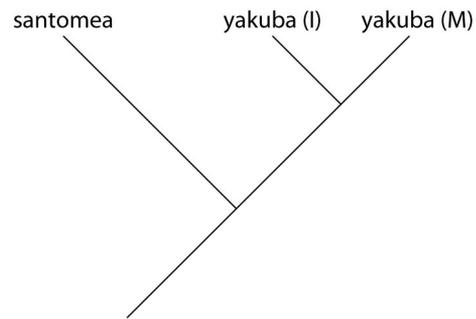
23) Which of these evolutionary trees represents the situation described in the previous paragraph (Note: *Yakuba (I)* represents the island population, and *yakuba (M)* represents the mainland population)?

23) _____

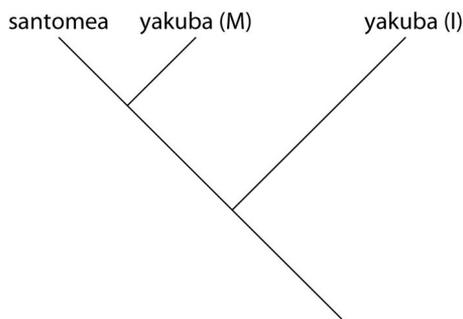
A)



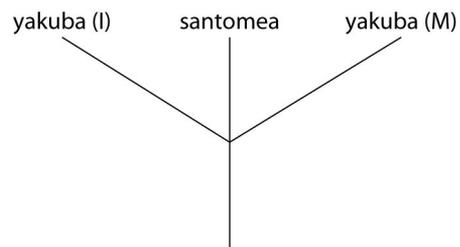
B)



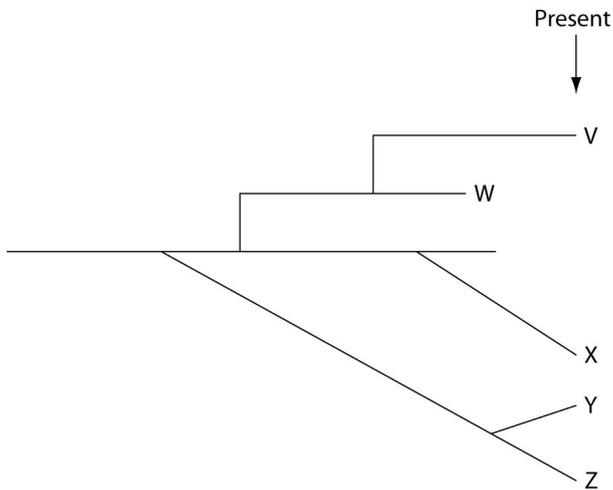
C)



D)



The next few questions refer to the following evolutionary tree, whose horizontal axis represents time (present time is on the far right) and whose vertical axis represents morphological change.

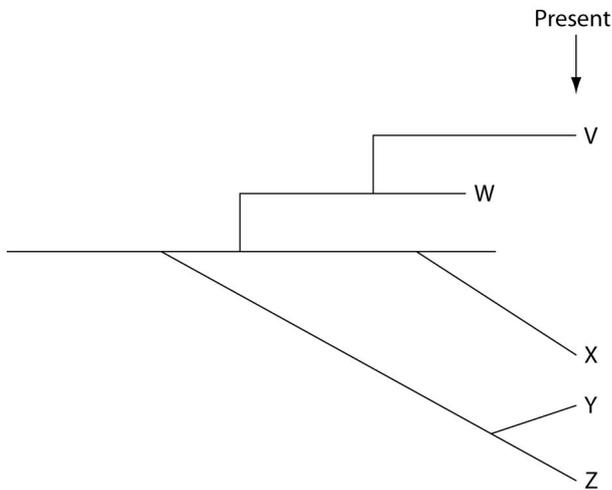


24) Which species is *least* expected to have a good record of transitional fossils; in other words, which species' fossils, if present at all, are expected only in relatively superficial (i.e., shallow) strata? 24) _____
 A) V B) W C) X D) Y E) Z

25) A hybrid zone is properly defined as 25) _____
 A) an area where mating occurs between members of two closely related species, producing viable offspring.
 B) an area where two closely related species' ranges overlap.
 C) an area where members of two closely related species intermingle, but experience no gene flow.
 D) a zone that includes the intermediate portion of a cline.
 E) a zone that features a gradual change in species composition where two neighboring ecosystems border each other.

26) Which of the following statements about species, as defined by the biological species concept, is (are) correct? 26) _____
 I. Biological species are defined by reproductive isolation.
 II. Biological species are the model used for grouping extinct forms of life.
 III. The biological species is the largest unit of population in which successful interbreeding is possible.
 A) I and II B) I and III C) II and III D) I, II, and III

The next few questions refer to the following evolutionary tree, whose horizontal axis represents time (present time is on the far right) and whose vertical axis represents morphological change.

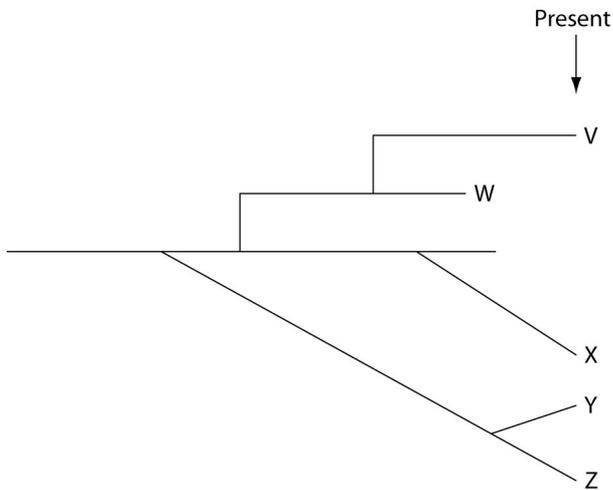


27) Which of these five species originated earliest and appeared suddenly in the fossil record? 27) _____
 A) V B) W C) X D) Y E) Z

28) What is true of the flightless cormorants of the Galápagos Islands? 28) _____
 A) Their DNA has low levels of sequence homology with the DNA of flying American cormorants.
 B) They are close relatives of flightless cormorants from the Americas.
 C) They are descendants of the same common ancestor that gave rise to the unique finches of these islands.
 D) If they are still able to breed successfully with flying cormorants, it would probably be with North American cormorants, rather than with South American cormorants.
 E) Flightless cormorants on one island have restricted gene flow with those on other islands, which could someday lead to a macroevolutionary event.

29) In a hypothetical situation, a certain species of flea feeds only on pronghorn antelopes. In rangelands of the western United States, pronghorns and cattle often associate with one another. If some of these fleas develop a strong preference for cattle blood and mate only with other fleas that prefer cattle blood, then over time which of these should occur, if the host mammal can be considered as the fleas' habitat? 29) _____
 1. reproductive isolation
 2. sympatric speciation
 3. habitat isolation
 4. prezygotic barriers
 A) 1 only
 B) 2 and 3
 C) 1, 2, and 3
 D) 2, 3, and 4
 E) 1 through 4

The next few questions refer to the following evolutionary tree, whose horizontal axis represents time (present time is on the far right) and whose vertical axis represents morphological change.



- 30) Which of these five species is the extant (i.e., not extinct) species that is most closely related to species X, and why is this so? 30) _____
- A) V; shared a common ancestor with X most recently
 - B) Z; shared a common ancestor with X most recently, and arose in the same fashion as X
 - C) W; shared a common ancestor with X most recently
 - D) Y; arose in the same fashion (i.e., at the same tempo) as X
 - E) This tree does not provide enough information to answer this question.

Use the following information to answer the following questions.

In those parts of equatorial Africa where the malaria parasite is most common, the sickle-cell allele constitutes 20% of the β hemoglobin alleles in the human gene pool.

- 31) With respect to the sickle-cell allele, what should be true of the β hemoglobin locus in U.S. populations of African-Americans whose ancestors were from equatorial Africa? 31) _____
1. The average heterozygosity at this locus should be decreasing over time.
 2. There is an increasing heterozygote advantage at this locus.
 3. Diploidy is helping to preserve the sickle-cell allele at this locus.
 4. Frequency-dependent selection is helping to preserve the sickle-cell allele at this locus.
- A) 1 only B) 1 and 3 C) 2 and 3 D) 1, 2, and 3 E) 1, 2, and 4
- 32) In the United States, the parasite that causes malaria is not present, but African-Americans whose ancestors were from equatorial Africa are present. What should be happening to the sickle-cell allele in the United States, and what should be happening to it in equatorial Africa? 32) _____
- A) directional selection; disruptive selection
 - B) stabilizing selection; disruptive selection
 - C) disruptive selection; directional selection
 - D) directional selection; stabilizing selection
 - E) disruptive selection; stabilizing selection

- 33) Swine are vulnerable to infection by bird flu virus and human flu virus, which can both be present in an individual pig at the same time. When this occurs, it is possible for genes from bird flu virus and human flu virus to be combined, thereby producing a genetically distinctive virus, which can subsequently cause widespread disease. 33) _____

The production of new types of flu virus in the manner described above is most similar to the phenomenon of

- A) natural selection.
- B) bottleneck effect.
- C) gene flow.
- D) sexual selection.
- E) founder effect.

- 34) A fruit fly population has a gene with two alleles, $A1$ and $A2$. Tests show that 70% of the gametes produced in the population contain the $A1$ allele. If the population is in Hardy-Weinberg equilibrium, what proportion of the flies carry both $A1$ and $A2$? 34) _____
- A) 0.09 B) 0.49 C) 0.42 D) 0.7 E) 0.21

In the year 2500, five male space colonists and five female space colonists (all unrelated to each other) settle on an uninhabited Earthlike planet in the Andromeda galaxy. The colonists and their offspring randomly mate for generations. All ten of the original colonists had free earlobes, and two were heterozygous for that trait. The allele for free earlobes is dominant to the allele for attached earlobes.

- 35) Which of these is closest to the allele frequency in the founding population? 35) _____
- A) 0.2 a , 0.8 A B) 0.4 a , 0.6 A C) 0.8 a , 0.2 A D) 0.5 a , 0.5 A E) 0.1 a , 0.9 A

Use the following information to answer the following questions.

In those parts of equatorial Africa where the malaria parasite is most common, the sickle-cell allele constitutes 20% of the β hemoglobin alleles in the human gene pool.

- 36) The sickle-cell allele is pleiotropic (i.e., it affects more than one phenotypic trait). Specifically, this allele affects oxygen delivery to tissues and affects one's susceptibility to malaria. Under conditions of low atmospheric oxygen availability, individuals heterozygous for this allele can experience life-threatening sickle-cell "crises." Such individuals remain less susceptible to malaria. Thus, pleiotropic genes/alleles such as this can help explain why 36) _____
- A) new advantageous alleles do not arise on demand.
 - B) chance events can affect the evolutionary history of populations.
 - C) evolution is limited by historical constraints.
 - D) adaptations are often compromises.
- 37) Considering the overall human population of the U.S. mainland at the time when the slave trade brought large numbers of people from equatorial Africa, what was primarily acting to change the frequency of the sickle-cell allele in the overall U.S. population? 37) _____
- A) natural selection
 - B) genetic drift
 - C) gene flow
 - D) founder effect
 - E) Two of the responses are correct.

- 38) Whenever diploid populations are in Hardy-Weinberg equilibrium at a particular locus 38) _____
 A) this means that, at this locus, two alleles are present in equal proportions.
 B) the allele's frequency should not change from one generation to the next, but its representation in homozygous and heterozygous genotypes may change.
 C) the population itself is not evolving, but individuals within the population may be evolving.
 D) natural selection, gene flow, and genetic drift are acting equally to change an allele's frequency.
- 39) Although each of the following has a better chance of influencing gene frequencies in small 39) _____
 populations than in large populations, which one most consistently requires a small population as a precondition for its occurrence?
 A) nonrandom mating
 B) natural selection
 C) gene flow
 D) genetic drift
 E) mutation
- 40) In the formula for determining a population's genotype frequencies, the 2 in the term $2pq$ is 40) _____
 necessary because
 A) heterozygotes can come about in two ways.
 B) the population is diploid.
 C) heterozygotes have two alleles.
 D) the population is doubling in number.

In the year 2500, five male space colonists and five female space colonists (all unrelated to each other) settle on an uninhabited Earthlike planet in the Andromeda galaxy. The colonists and their offspring randomly mate for generations. All ten of the original colonists had free earlobes, and two were heterozygous for that trait. The allele for free earlobes is dominant to the allele for attached earlobes.

- 41) If four of the original colonists died before they produced offspring, the ratios of genotypes could 41) _____
 be quite different in the subsequent generations. This would be an example of
 A) disruptive selection.
 B) genetic drift.
 C) stabilizing selection.
 D) gene flow.
 E) diploidy.
- 42) If one assumes that Hardy-Weinberg equilibrium applies to the population of colonists on this 42) _____
 planet, about how many people will have attached earlobes when the planet's population reaches 10,000?
 A) 1,000 B) 10,000 C) 100 D) 800 E) 400
- 43) There are those who claim that the theory of evolution cannot be true because the apes, which are 43) _____
 supposed to be closely related to humans, do not likewise share the same large brains, capacity for complicated speech, and tool-making capability. They reason that if these features are generally beneficial, then the apes should have evolved them as well. Which of these provides the best argument against this misconception?
 A) Adaptations are often compromises.
 B) Evolution can be influenced by environmental change.
 C) A population's evolution is limited by historical constraints.
 D) Advantageous alleles do not arise on demand.

- 44) The restriction enzymes of bacteria protect the bacteria from successful attack by bacteriophages, whose genomes can be degraded by the restriction enzymes. The bacterial genomes are not vulnerable to these restriction enzymes because bacterial DNA is methylated. This situation selects for bacteriophages whose genomes are also methylated. As new strains of resistant bacteriophages become more prevalent, this in turn selects for bacteria whose genomes are not methylated and whose restriction enzymes instead degrade methylated DNA. The outcome of the conflict between bacteria and bacteriophage at any point in time results from _____
- A) frequency-dependent selection.
 - B) genetic variation being preserved by diploidy.
 - C) neutral variation.
 - D) evolutionary imbalance.
 - E) heterozygote advantage.
- 45) In a hypothetical population's gene pool, an autosomal gene, which had previously been fixed, undergoes a mutation that introduces a new allele, one inherited according to incomplete dominance. Natural selection then causes stabilizing selection at this locus. Consequently, what should happen over the course of many generations? _____
- A) The population's average heterozygosity should decrease.
 - B) The two homozygotes should decrease at different rates.
 - C) The proportion of the population that is heterozygous at this locus should remain constant.
 - D) The proportions of both types of homozygote should decrease.
- 46) Both ancestral birds and ancestral mammals shared a common ancestor that was terrestrial. Today, penguins (which are birds) and seals (which are mammals) have forelimbs adapted for swimming. What term best describes the relationship of the bones in the forelimbs of penguins and seals, and what term best describes the flippers of penguins and seals? _____
- A) homologous; homologous
 - B) homologous; analogous
 - C) analogous; homologous
 - D) analogous; analogous
- 47) Which of the following is *not* an observation or inference on which natural selection is based? _____
- A) There is heritable variation among individuals.
 - B) Species produce more offspring than the environment can support.
 - C) Individuals whose characteristics are best suited to the environment generally leave more offspring than those whose characteristics are less well suited.
 - D) Poorly adapted individuals never produce offspring.
 - E) Only a fraction of an individual's offspring may survive.
- 48) What was the prevailing belief prior to the time of Lyell and Darwin? _____
- A) Earth is millions of years old, and populations are unchanging.
 - B) Earth is a few thousand years old, and populations are unchanging.
 - C) Earth is a few thousand years old, and populations gradually change.
 - D) Earth is millions of years old, and populations rapidly change.
 - E) Earth is millions of years old, and populations gradually change.
- 49) If one wanted to find the largest number of endemic species, one should visit which of the following geological features (assuming each has existed for several millions of years)? _____
- A) a midcontinental grassland with extreme climatic conditions
 - B) an extensive mountain range
 - C) an isolated ocean island in the tropics
 - D) a shallow estuary on a warm-water coast

- 50) Which of Darwin's ideas had the strongest connection to Darwin having read Malthus's essay on human population growth? 50) _____
- A) struggle for existence
 - B) the ability of related species to be conceptualized in "tree thinking"
 - C) variation among individuals in a population
 - D) descent with modification
 - E) that the ancestors of the Galápagos finches had come from the South American mainland
- 51) In a hypothetical environment, fishes called pike-cichlids are visual predators of algae-eating fish (in other words, they locate their prey by sight). If a population of algae-eaters experiences predation pressure from pike-cichlids, which of the following is least likely to be observed in the algae-eater population over the course of many generations? 51) _____
- A) selection for nocturnal algae-eaters (active only at night)
 - B) selection for algae-eaters that become sexually mature at smaller overall body sizes
 - C) selection for drab coloration of the algae-eaters
 - D) selection for algae-eaters that are faster swimmers
 - E) selection for larger female algae-eaters, bearing broods composed of more, and larger, young
- 52) If the bacterium *Staphylococcus aureus* experiences a cost for maintaining one or more antibiotic-resistance genes, then what should happen in environments from which antibiotics are missing? 52) _____
- A) These bacteria should be outcompeted and replaced by bacteria that have lost these genes.
 - B) The bacteria should try to make the cost worthwhile by locating, and migrating to, microenvironments where traces of antibiotics are present.
 - C) The bacteria should start making and secreting their own antibiotics.
 - D) These genes should continue to be maintained in case the antibiotics ever appear.
- 53) What must be true of any organ that is described as *vestigial*? 53) _____
- A) It need be neither homologous nor analogous to some feature in an ancestor.
 - B) It must be both homologous and analogous to some feature in an ancestor.
 - C) It must be analogous to some feature in an ancestor.
 - D) It must be homologous to some feature in an ancestor.
- 54) Catastrophism, meaning the regular occurrence of geological or meteorological disturbances (catastrophes), was Cuvier's attempt to explain the existence of 54) _____
- A) uniformitarianism.
 - B) the fossil record.
 - C) natural selection.
 - D) the origin of new species.
 - E) evolution.
- 55) Which of the following represents an idea that Darwin learned from the writings of Thomas Malthus? 55) _____
- A) The environment is responsible for natural selection.
 - B) Technological innovation in agricultural practices will permit exponential growth of the human population into the foreseeable future.
 - C) Populations tend to increase at a faster rate than their food supply normally allows.
 - D) Earth changed over the years through a series of catastrophic upheavals.
 - E) Earth is more than 10,000 years old.

- 56) Of the following anatomical structures, which is homologous to the bones in the wing of a bird? 56) _____
A) bones in the flipper of a whale
B) chitinous struts in the wing of a butterfly
C) bony rays in the tail fin of a flying fish
D) bones in the hind limb of a kangaroo
E) cartilage in the dorsal fin of a shark
- 57) A high degree of endemism is most likely in environments that are 57) _____
A) isolated and homogeneous.
B) easily reached and homogeneous.
C) isolated and heterogeneous.
D) easily reached and heterogeneous.
E) isolated and extremely cold.
- 58) Natural selection is based on all of the following *except* 58) _____
A) populations tend to produce more individuals than the environment can support.
B) individuals adapt to their environments and, thereby, evolve.
C) genetic variation exists within populations.
D) the best-adapted individuals tend to leave the most offspring.
E) individuals who survive longer tend to leave more offspring than those who die young.
- 59) During a study session about evolution, one of your fellow students remarks, "The giraffe stretched its neck while reaching for higher leaves; its offspring inherited longer necks as a result." Which statement is most likely to be helpful in correcting this student's misconception? 59) _____
A) Characteristics acquired during an organism's life are generally not passed on through genes.
B) Disuse of an organ may lead to its eventual disappearance.
C) Only favorable adaptations have survival value.
D) If the giraffes did not have to compete with each other, longer necks would not have been passed on to the next generation.
E) Spontaneous mutations can result in the appearance of new traits.
- 60) What is true of pseudogenes? 60) _____
A) They are the same things as introns.
B) They are unrelated genes that code for the same gene product.
C) They are vestigial genes.
D) They are composed of RNA, rather than DNA.
- 61) Which of the following statements best describes theories? 61) _____
A) They are supported by, and make sense of, many observations.
B) They are nearly the same things as hypotheses.
C) They are predictions of future events.
D) They cannot be tested because the described events occurred only once.
- 62) Ichthyosaurs were aquatic dinosaurs. Fossils show us that they had dorsal fins and tails, as do fish, even though their closest relatives were terrestrial reptiles that had neither dorsal fins nor aquatic tails. The dorsal fins and tails of ichthyosaurs and fish are 62) _____
A) examples of convergent evolution.
B) homologous.
C) adaptations to a common environment.
D) Three of the responses above are correct.
E) Two of the responses above are correct.

Answer Key

Testname: STUDY GUIDE 22-25

- 1) B
- 2) D
- 3) E
- 4) A
- 5) D
- 6) A
- 7) D
- 8) D
- 9) C
- 10) E
- 11) D
- 12) C
- 13) A
- 14) A
- 15) A
- 16) D
- 17) C
- 18) E
- 19) E
- 20) E
- 21) A
- 22) C
- 23) B
- 24) A
- 25) A
- 26) B
- 27) B
- 28) E
- 29) E
- 30) A
- 31) B
- 32) D
- 33) C
- 34) C
- 35) E
- 36) D
- 37) C
- 38) B
- 39) D
- 40) A
- 41) B
- 42) C
- 43) D
- 44) A
- 45) D
- 46) B
- 47) D
- 48) B
- 49) C
- 50) A

Answer Key

Testname: STUDY GUIDE 22-25

- 51) E
- 52) A
- 53) D
- 54) B
- 55) C
- 56) A
- 57) C
- 58) B
- 59) A
- 60) C
- 61) A
- 62) E